

Thuja occidentalis - (*Picea mariana* - *Abies balsamea*) / *Alnus incana* Forest
[White Cedar - (Mixed Conifer) / Alder Swamp]

COMMON NAME	Northern White-cedar - (Black Spruce, Balsam Fir) / Speckled Alder Forest
SYNONYM	White Cedar - (Mixed Conifer) / Alder Swamp
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Saturated temperate or subpolar needle-leaved evergreen forest (I.A.8.N.g)
ALLIANCE	THUJA OCCIDENTALIS SATURATED FOREST ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM TERRESTRIAL

RANGE

Voyageurs National Park

This type occurs in localized areas throughout the park.

Globally

This community is found in northern Minnesota, northern Wisconsin, Upper and Lower Michigan, southeastern Manitoba, and northwestern Ontario.

ENVIRONMENTAL DESCRIPTION

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This type occurs in moderately minerotrophic conditions over deep peat. Hummock and hollow microtopography is usually well developed. In wetter stands, there is often standing water present in the hollows. Coarse woody debris can be significant. The water regime is saturated.

Globally

This community is found on level to gently sloping ground with wet, organic (Sims *et al.* 1989) or mineral soil (MN NHP 1993). Stands typically occur along the margins of peatlands, in drainage courses, or shallow depressions. The substrate has moderately minerotrophic conditions over deep peat. Hummock and hollow microtopography is usually well developed. In wetter stands, there is often standing water present in the hollows. Coarse woody debris can be significant. The water regime is saturated.

Schwintzer and Tomberlin (1982) reported detailed results on the chemical characteristics of the ground water of several wetland types in Lower Michigan. They found that it was difficult to differentiate swamps dominated by conifers from those dominated by other vegetation on the basis of ground water. The swamps were moderately to strongly minerotrophic and had circumneutral pH.

MOST ABUNDANT SPECIES

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<u>Stratum</u>	<u>Species</u>
Emergent tree	<i>Picea mariana</i>
Tree canopy	<i>Thuja occidentalis</i> , <i>Larix laricina</i>
Tall shrub	<i>Alnus incana</i> , <i>Abies balsamea</i> , <i>Betula pumila</i>
Short shrub	<i>Ledum groenlandicum</i> , <i>Rubus pubescens</i>
Forb	<i>Cornus canadensis</i> , <i>Mitella nuda</i> , <i>Maianthemum trifolium</i>
Graminoid	<i>Carex</i> spp., <i>Calamagrostis canadensis</i>
Nonvascular	<i>Sphagnum</i> spp., <i>Calliergon</i> spp., <i>Rhytidiadelphus triquetrus</i> , <i>Drepanocladus</i> spp.

Globally

<u>Stratum</u>	<u>Species</u>
Tree canopy	<i>Thuja occidentalis</i>
Tall shrub	<i>Alnus incana</i>

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Forb	<i>Coptis trifolia</i> , <i>Maianthemum canadense</i>
Graminoid	<i>Calamagrostis canadensis</i> , <i>Carex disperma</i> , <i>Carex leptalea</i>
Nonvascular	<i>Hylocomium splendens</i> , <i>Rhytidiadelphus triquetrus</i> , <i>Sphagnum</i> spp.

CHARACTERISTIC SPECIES

Voyageurs National Park

Thuja occidentalis, *Alnus incana*, *Sphagnum* spp.

Globally

Thuja occidentalis, *Alnus incana*, *Coptis trifolia*, *Carex disperma*, *Hylocomium splendens*, *Sphagnum* spp.

VEGETATION DESCRIPTION

Voyageurs National Park

Thuja occidentalis typically forms a fairly closed canopy in this community with covers ranging from 70-100%. In larger peatlands, however, the canopy may be as low as 30%. It is in these larger peatlands that an emergent layer of *Picea mariana* becomes common with low (10-20%) cover. A shrub layer of *Alnus incana* and/or *Abies balsamea* is nearly always present but cover is highly variable, ranging from 20-90%. Other species common in the shrub layer include *Thuja occidentalis*, *Betula pumila*, and *Fraxinus nigra*. A dwarf-shrub strata, if present, exists at low (10-25%) cover but can be quite species diverse. Most abundant species include *Ledum groenlandicum*, *Cornus rugosa*, *Fraxinus nigra*, *Lonicera oblongifolia*, and *Ribes* spp. Cover in the herbaceous strata is highly variable and ranges from 30-90%. Species diversity in the herbaceous strata is very high. The most abundant species are *Rubus pubescens*, *Carex trisperma*, *Carex disperma*, *Carex leptalea*, *Calamagrostis canadensis*, *Cornus canadensis*, *Mitella nuda*, *Equisetum sylvaticum*, *Iris versicolor*, and *Gymnocarpium dryopteris*. Like the herbaceous layer, the nonvascular strata can be very diverse. In some circumstances, *Sphagnum* spp. dominate the nonvascular strata with 90-100% cover, leaving other species like *Rhytidiadelphus triquetrus* and *Calliergon cordifolium* to colonize the wet hollows. In other cases, though, *Sphagnum* spp. is found sharing dominance with a mix of *Rhytidiadelphus triquetrus*, *Calliergon cordifolium*, *Calliergon giganteum*, *Rhizomnium magnifolium*, *Rhizomnium pseudopunctatum* and *Climacium dendroides*. In both cases, the dominant *Sphagnum* species found in this community are *Sphagnum warnstorffii*, *Sphagnum wulfianum*, *Sphagnum centrale*, and *Sphagnum recurvum sensu lato*.

The White Cedar Tamarack Peat Swamp phase is a mixed evergreen-deciduous forest dominated by conifers, especially *Thuja occidentalis* and *Larix laricina*. In some cases, *Larix laricina*, along with lesser amounts of *Picea mariana*, may form an emergent layer over a canopy of *Thuja occidentalis*. Canopy coverage is typically 30-60% and is commonly composed of uneven aged trees. Though typically 10-15 m tall, in some cases trees may be 5-10 m tall. A shrub/scrub layer of *Alnus incana*, *Betula pumila*, and/or *Thuja occidentalis* is usually present at 40-70% cover. A dwarf-shrub layer of *Rubus pubescens*, *Cornus canadensis*, *Ledum groenlandicum* and/or *Chamaedaphne calyculata* is typically present at low cover. The herbaceous strata is fairly diverse and exists at a wide range of densities. The most abundant species are, *Carex leptalea* and *Maianthemum trifolium*. *Sphagnum* moss normally forms a continuous carpet on the forest floor. This strata is dominated by *Sphagnum warnstorffii*, *Sphagnum capillifolium*, *Sphagnum magellanicum*, and *Sphagnum russowii*. Wet hollows may be colonized by *Calliergon cordifolium*, *Calliergon giganteum*, *Mniaceae*, and/or *Drepanocladus* spp.

Globally

The canopy is often moderately dense to dense (MN NHP 1993). Basal areas of 42.2-62.2 m²/ha and densities of 2457-7565 stems/ha have been reported in four stands in Lower Michigan, using a tree definition of woody stems greater than 2.5 cm dbh (Schwintzer 1981). The understory structure consists of high hummocks and deep, water-filled hollows, with fallen, moss-covered logs common. *Thuja occidentalis* is usually moderately to strongly dominant in the canopy, but occasionally *Picea mariana* may overtop the subdominant *Thuja occidentalis*. Other species include *Abies balsamea*, *Acer rubrum*, *Betula papyrifera*, *Fraxinus nigra*, *Larix laricina* and, more rarely, *Picea glauca* (in northern Minnesota and northwestern Ontario), or *Tsuga canadensis* (eastward). The shrub layer in this community is sparse to dense, in inverse proportion to the tree canopy. Species present in this stratum include *Alnus incana*, *Chamaedaphne calyculata*, *Cornus sericea*, *Gaultheria hispidula*, *Ledum groenlandicum*, *Linnaea borealis*, *Rosa acicularis*, *Rubus pubescens*, and *Vaccinium myrtilloides*. *Nemopanthus mucronatum* and *Viburnum cassinoides* are more common eastward. Species diversity in the herbaceous layer can be very high. The most common species are *Carex* spp. (including *Carex disperma*, *Carex leptalea*), *Coptis trifolia*, *Cornus canadensis*, *Clintonia borealis*, *Dryopteris carthusiana*, *Galium triflorum*, *Maianthemum canadense*, *Mitella nuda*, *Trientalis borealis*, and *Viola renifolia*. Mosses include *Hylocomium splendens*, *Pleurozium schreberi*, *Ptilium crista-*

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castrensis, *Rhytidiadelphus triquetrus*, *Sphagnum capillifolium*, *Sphagnum girgensohnii*, and *Sphagnum magellanicum*. Moss cover may be thin where the canopy is very dense. Diagnostic species include *Thuja occidentalis* as a dominant/co-dominant species, with a combination of acidic and minerotrophic understory species, such as *Alnus incana* and *Cornus sericea* (Sims *et al.* 1989, Harris *et al.* 1996, Chambers *et al.* 1997).

CONSERVATION RANK G4.

DATABASE CODE CEG002456

COMMENTS

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Diagnostic features of the type are canopy of *Thuja occidentalis* with *Alnus incana* shrubs and *Sphagnum* spp moss. This type is somewhat analogous to Ontario's W31 (Harris *et al.* 1996). In wetter and more minerotrophic conditions, the cedar in the canopy is often mixed with black ash and can grade into the White Cedar-Black Ash Swamp. The White Cedar-Black Ash Swamp, however, must have at least 25% of both cedar and ash in the canopy or a canopy of black ash with a subcanopy of cedar. The White Cedar-Black Ash Swamp also tends to have much less *Sphagnum* spp. than does the White Cedar-Mixed Conifer/Alder Swamp.

In the cases where *Larix laricina* is present in the canopy or in the emergent layer, the White Cedar-Mixed Conifer/Alder Swamp can grade into the White Cedar-Tamarack Peat Swamp. Tamarack must be present with at least 25% of the relative cover for a stand to be considered a White Cedar-Tamarack Peat Swamp.

In the cases where *Larix laricina* (Tamarack) is present in the canopy or in the emergent layer, the White Cedar-Mixed Conifer/Alder Swamp (WCS) can grade into a phase described as the White Cedar-Tamarack Peat Swamp (WCT). At Voyageurs, this phase was not recognized as a separate association because the phase is very similar to stands without Tamarack as a dominant. So both WCS and WCT are placed into the one association. (CEG002456). Tamarack must be present with at least 25% of the relative cover for a stand to be considered part of the White Cedar-Tamarack Peat Swamp phase. Globally this phase is recognized as a distinct type (CEG005225), based on patterns outside of Voyageurs.

This is one of the most floristically diverse types in the park. The richer stands of this type often contain many orchids including the state flower, *Cypripedium reginae*.

Globally

See Harris *et al.* (1996) type W31 for further descriptions of Ontario examples of this type. Tipup mounds caused by blowdowns are common, in part because the very wet soils permit only shallow rooting by *Thuja occidentalis*.

REFERENCES

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